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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,236	04/06/2004	Kyle Baldwin	2156-608A	7473

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EXAMINER	
SULLIVAN, CALEEN O	

ART UNIT	PAPER NUMBER
1756	

MAIL DATE	DELIVERY MODE
08/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/820,236	BALDWIN ET AL.	
	Examiner	Art Unit	
	Caleen O. Sullivan	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 August 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/11/2007 has been entered.

2. Claim 2 has been cancelled

3. Claims 1 and 3-20 are pending

Response to Amendment

4. Applicant's amendment to claims 1 and 3 has overcome the rejection of claims 1 and 19-20 under 35 USC 102(b) over Thomas ('035) presented in the previous office action; however in light of the amendments Examiner presents new grounds of rejection below.

5. Applicants amendment to claims 1 and 3 and the cancellation of claim 2 has overcome the rejection of claims 2-18 under 35 USC 103(a) over Thomas ('035) in view of Minter ('035); however, in light of the amendments and the cancellation of claim 2 Examiner presents new grounds of rejection below.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1 and 3-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas ('035) in view of Minter ('051) further in view of Lawson ('320).

Thomas ('051) discloses a process of forming high-resolution film patterns using multiple dry-film resist layers. (See, abstract). Thomas ('051) discloses the process consists of first removing the release sheet of the first layer which is then laminated to a substrate using heat and pressure. (See, col.5, 36-39). Then, Thomas ('051) discloses, the oxygen barrier layer is peeled off and a second resist layer with the release sheet removed is placed over the first layer and subjected to heat and pressure such as the first resist layer was subjected to. (See, col.5, 45-50). The next step in the process disclosed in Thomas ('051) is a single exposure using a mask having opaque portions, which is placed over the oxygen barrier layer of the second resist film layer and the entire top surface of the structure. (See, col.5, 67-col.6,8). Thomas ('051) discloses that the irradiation results in the hardening of the resist in regions that are beneath the apertures of the mask (See, col.6, 1-8).

Next, Thomas ('051) discloses that after the mask and Polyethylene sheet are removed the resist is developed in a single step, which meets the limitation of claim 1 where the first and second dry-film layers are developed with a developer capable of developing both layers to produce an image on the substrate. (See, col.6, 9-15). The developing step Thomas ('051) discloses is followed by a step where the apertures beneath the mask layer, formed in the resist layers, is filled with

material that is an electroplated electrically conductive material formed directly on the layer between portions of the remaining resist. (See, col.6, 24-31). Thomas ('051) also discloses the material us plated up to the level of the top surface of the laminated resist. (See, col.6, 29-31). Lastly, Thomas ('051) discloses the remaining resist is removed by being subjected to an alkaline stripper or a solvent stripper such as methylene chloride, which meets the limitation of claim 19. (See, col.6, 31-36).

Although Thomas ('051) does not explicitly disclose that the first resist layer has a breaking point of 30% and the second resist layer has a breaking point of 60%, one of ordinary skill in the art would appreciate that the resist layers would have different breaking points in order to effectively strip the first resist layer from the substrate.

Thomas ('051) goes on to disclose that typically the dry resist is provided in the form of a sheet that has a polyester oxygen barrier layer or sheet on one surface, which functions to prevent oxygen degradation when the sheet is exposed to the ambient atmosphere or oxidizing chemicals and a polyethylene release sheet underneath to keep the sheets separate while shipping. (See, col.5, 26-35; Fig.1). This disclosure meets the limitations of claims 11-13. Thomas ('051) further discloses that after the first resist layer is laminated on the substrate the polyester oxygen barrier layer is removed, as recited in claim 14, and then the second resist layer is applied by lamination over the first layer. (See, col.5, 46-50). Thomas ('051) also discloses that the polyester oxygen barrier layer of the second resist layer remains on top, and the imaging of the resist occurs over this barrier layer, as recited in claim 15. (See, col.5, 61, col.6, 2; Fig.2).

Still Thomas ('051) fails to disclose that the first film layer develops faster than the second film layer. Thomas ('051) also fails to disclose that the development dwell time of the first layer is 40-60 seconds and the development dwell time for the second layer is 80-120 seconds. Moreover,

Thomas ('051) fails to disclose that the curing speed of the first layer is 30-100mJ and the curing speed of the second layer is 5-20mJ. However, Minter ('035) discloses a pattern forming process using multiple resist layers with such properties.

Minter ('035) discloses a process of forming a usually T-shaped metal contact on a dielectric substrate. The method disclosed in Minter ('035) uses two photoresist layers that consist of different types of resists with different solubilities that are coated on a substrate to form the T-shaped metal contact. (See, col.5, 65-col.6, 2; col.4, 65-67). This meets the limitation of claim 1 where the dry-film layers have different development times or curing speeds. Although Minter ('035) does not explicitly disclose that the first layer has a faster development time than the second layer it necessary follows that in order to form an overhang of the second or upper resist layer on the first or lower resist layer, which is an object of the process disclosed in Minter ('035), the first or lower layer must have faster development time than the second or upper resist layer. (See, col.9, 55-67).

Minter ('035) discloses the process consists of exposing and developing the resist layers either sequentially or simultaneously and then depositing metal onto the upper resist layer that also fills the cavities in the resist layers. (See, col.10, 3-6). Minter ('035) discloses that the deposition step is then followed by a step of soaking the entire construct in solvent so the metal on the resist layers dissolved in the solvent is lifted off, leaving well-defined T-gate metal contacts on the substrate. (See, col.10, 1-6).

Minter ('035) explains that the T-gate metal contact, which is a ledge formed at the upper surface of the first layer of photoresist, forms because the cavity in the surface of photoresist layer 2 after development is narrower as it approaches the first layer of photoresist. (See, col. 9, 55-67). This disclosure teaches the limitation of claim 16 where after development the second photoimageable film overhangs the first photoimageable film. Minter ('035) then discloses that the metal layer can be

applied by techniques that include sputtering as recited in claim 17, and that any suitable metal for deposition includes any metal that is typically used in the formation of microelectronic devices, which includes gold as recited in claim 18. (See, col. 10, 6-11).

Minter ('035) also discloses possible compositions for each photoresist layer coated on the substrate. Minter ('035) discloses that the photoresist layers can be a mixture that includes a binder resin such as poly (4-hydroxystyrene), a monomer such as polymethylmethacrylate- methacrylic acid, and a photo sensitizer that is comprised of hydroxyl benzophenones, which are then mixed together with a suitable solvent. Minter ('035) also discloses that other conventional additives such as dyes, adhesion promoters, or non-ionic surfactants can be added to the photoresist composition of either layer before deposition on the substrate. This disclosure in Minter ('035) teaches the limitations of claims 5-10.

Although Thomas ('051) in view of Minter ('035) fails to explicitly disclose the specific development dwell times disclosed in claim 3 or the specific cure speeds, recited in claim 4, for the upper or lower resist film layers used in the patterning process each reference teaches, the recitations of claims 3 and 4 quantify the qualitative limitations recited in claim 1 for the development dwell time and curing speed of each dry-film layer. However, Lawson ('320) teaches that curing speed of a radiation curable compound is effected by the concentration of acrylate groups present in the compound. (See, col.4, 33-47). Specifically Lawson ('320) discloses that as the concentration of the polyacrylate increase in the composition the viscosity and the cure speed of the composition decreases. (See, col.4, 33-47). Applicant also discloses in the specification that by changing the composition of the dry-film layers, such as the amount of binder or photoinitiator or other component that effects development and curing of the resist layer. (See, pg.8, 8-17). Therefore, it would have been obvious to one of ordinary skill in the art to optimize the composition of the dry

film layers to obtain the development dwell times and curing speeds recited by applicant in claims 3 and 4. See, *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See also MPEP. 2144.05.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the teachings of Thomas ('051) with the teachings of Minter ('035) and the teachings of Lawson ('320) because Minter ('035) teaches that one can form an overhang pattern using multiple resist layers with different development properties to form an overhang of the upper resist layer over the lower resist layer to which a metal layer can be applied to form a contact pattern by a lift-off method and Lawson ('320) teaches that the cure speeds and other properties of radiation curable compounds that can comprise resist layers can be modified by varying the presence of certain components that effect cure speed in the composition.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caleen O. Sullivan whose telephone number is 571-272-6569. The examiner can normally be reached Monday-Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/COS/, 08/21/07.

MARK F. HUFF
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